

OBJECTIVES

Upon completion of this module, the student will be able to:

1. Select, from a list, the types of uncured heat-processed ground meat products that have special heating, stabilization, and labeling requirements.
2. Define the following terms as they relate to uncured heat-processed meat patties.
 - Heat-processed
 - Partially cooked
 - Fully cooked
 - Patty
 - Comminuted
 - Char-marked
3. Describe the inspection program employee's responsibilities when determining the compliance of uncured heat-processed meat patties with regulatory requirements.
4. Describe the method of checking accuracy (calibration) of the thermocouple thermometer.
5. Describe the method of determining the cold spot of the heating unit.
6. State the reason why dial thermometers are not suitable for determining the internal temperature of an uncured heat-processed meat patty.
7. Specify when the thermocouple thermometer requires cleaning and sanitizing.
8. Describe the procedure for verifying the internal temperature and holding time of a fully cooked meat patty.
9. Select the correct method of inserting the thermocouple thermometer probe into a heat-processed meat patty.
10. Identify whether or not a heat process is in compliance or out of compliance.
11. State the stabilization performance standard for uncured heat-processed meat patties.
12. State what action establishment management must take if they experience a heating deviation.
13. Identify the special labeling requirements for uncured heat-processed meat patties.
14. Interpret the time and temperature criteria for fully cooked meat patties listed in Table A of §318.23 (b)(1) of the regulations.
15. Identify which products are subject to the requirements of §318.23 of the regulations.

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INTRODUCTION

The likelihood of foodborne illness is not the same in all meat and poultry products. Ground meat or poultry presents a different risk than whole cuts such as steaks, roasts, chops, or breasts for two reasons. First, ground meat or poultry is usually derived from trimmings that tend to have a higher probability of microbial contamination because a higher percentage of the trimmings come from the surface of the carcass. Second, the method of preparing ground meat and poultry ensures that any pathogens that are present will be distributed throughout the product (including the interior), while bacteria tend to remain on the surface of steaks, roasts, chops, and breasts. This factor has a significant impact on the cooking process. For instance, if a rare steak is thoroughly cooked on the surface, one can presume that any pathogenic bacteria that are present are killed. On the other hand, a rare meat patty that is thoroughly cooked on the surface does not provide such assurance.

The production of uncured heat-treated meat patties introduces two additional factors that increase the probability of foodborne illness. Cooking at lower temperatures can provide an environment that supports rapid multiplication of the bacteria that are present. The practice of partially cooking meat patties also introduces the possibility that these patties will be mistaken for fully cooked meat patties. The production and distribution of raw meat patties does not introduce the possibility of this type of human error.

According to data supplied by the Centers for Disease Control (CDC), there were seven (and possibly nine) outbreaks of *Escherichia coli* O157:H7 associated with ground beef, from February 1982 to April 1993. One of these outbreaks was attributed to pre-cooked (i.e., heat-treated) hamburger patties. This incident occurred in 1988, in a Minnesota school district. Also, in a 1985 incident, *Salmonella* was detected in supposedly fully cooked beef patties destined for a large public school district. Fortunately, the *Salmonella* was detected before the patties were consumed. In 1993, 500 people became ill after eating hamburgers prepared by a fast food restaurant chain. Cultures taken from both patties and infected patients indicated that *E. coli* O157:H7 was the causative organism. The investigation revealed that the raw product was not cooked sufficiently in the restaurants to eliminate the microbe.

To reduce the risk of foodborne disease outbreaks associated with partially and fully cooked meat patties prepared in federally inspected establishments, the Food Safety and Inspection Service amended the Federal meat inspection regulations in September of 1993. The changes included the development of specific requirements for heat-processing, cooling, handling, labeling, and storing of uncured heat-processed (fully cooked, partially cooked, and char-marked) meat patties. In January 1999, the cooling requirements were converted to a stabilization performance standard and the handling requirements were removed because they were redundant with the required SSOPs.

PRODUCTS COVERED IN §318.23

Section 318.23 of the regulations covers hamburger, Salisbury steaks, breaded and battered chopped veal steaks, beef patties, fritters (flattened cake-shaped), sausage (beef and/or pork) patties, and similar products that are produced and packaged at inspected establishments for sale to hotels, restaurants, and other institutional kitchens,

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as well as households. Approximately 225 establishments produce these types of uncured heat-processed meat patties. Products such as nuggets, meatballs, and Jamaican style patties are not covered by the regulation.

ESTABLISHMENT RESPONSIBILITIES

Official establishments have the responsibility of controlling the preparation of uncured heat-processed meat patties through process monitoring. They must ensure that the finished product is in compliance with the requirements of MPI regulations. In other words, establishment management is expected to have process control procedures and checks in place to identify, correct, and prevent any condition that could lead to noncompliance with the regulations. For example, to ensure control of the heat process, the official establishment *must* measure the internal temperature and the holding time of at least one fully cooked patty from *each* production line *each* hour of production. The temperature-measuring device used by the establishment *must* be accurate within plus or minus 1° F.

FSIS INSPECTION PROGRAM EMPLOYEE'S RESPONSIBILITIES

The inspection program employee's responsibilities include:

- Determining the compliance of uncured heat-processed meat patties with regulatory requirements for heat processing, stabilization, and labeling as directed through the Performance-Based Inspection System (PBIS). Inspection program employees assigned to an uncured heat-processed patty operation, must be able to:
 - ▶ Verify the internal temperature and holding time combination for fully cooked patties (Procedures 03G01/03G02)
 - ▶ **NOTE:** *Verifying the accuracy of the FSIS-issued thermocouple thermometer is considered part of these procedures.*
 - ▶ Verify the stabilization performance standard for uncured heat-processed meat patties (Procedures 03G01/03G02 and/or 03H01/03H02).
 - ▶ Determine if heating deviations are properly handled (Procedures 03G01/03G02 and possibly 03H01/03H02).
 - ▶ Ensure proper labeling of partially cooked and char-marked meat patties (Procedure 04B04).
 - ▶ Verify the accuracy of the establishment's temperature-measuring device (Procedure 03G01 and possibly 03H01)
- Take appropriate action as specified in FSIS Directive 5000.1 when inspection results indicate noncompliance with the regulations.

DEFINITIONS

In order to understand the procedures outlined in this module, a few terms must be defined:

Heat-Processed: treatment by a heat source, including, but not limited to, frying, broiling, baking, or roasting, which results in a fully cooked, partially cooked, or char-marked product.

Comminuted: a processing term describing the reduction in size of pieces of meat, including chopping, flaking, grinding, or mincing. It does not include chunking or sectioning.

Patty: a shaped and formed, comminuted, flattened cake of meat food product.

PROCESSING PROCEDURES FOR HEAT-PROCESSED MEAT PATTIES

Processing procedures for uncured heat-processed meat patties include:

- Heat processing (application of heat)
- Stabilization (chilling)
- Sanitary handling and storing
- Labeling (cooking instructions)

Heat-Processing Requirements

Uncured heat-processed meat patties are classified into three categories:

Fully cooked. Fully cooked patties must be prepared using one of the time and temperature combinations in Table A of §318.23 (see page 22.5). The stated temperature is the minimum internal temperature that must be reached and maintained at the geometric center of each patty for at **least** the stated time. The establishment should have the time and temperature that will be used on each lot available to the inspection program employee prior to the production run. The time and temperature combinations in Table A are designed to ensure the destruction of foodborne microbiological hazards (pathogens) that may be present, before the patties leave the establishment.

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Table A.
Permitted Heat-Processing Temperature/Time Combinations
For Fully Cooked Patties

Minimum internal temperature at the center of each patty		Minimum holding time after maximum temperature is reached	
DEGREES		TIME	
Fahrenheit	Centigrade	Minutes	Seconds
151	66.1	.68	41
152	66.7	.54	32
153	67.2	.43	26
154	67.8	.34	20
155	68.3	.27	16
156	68.9	.22	13
157 (and up)	69.4 (and up)	.17	10

Partially cooked. These uncured meat patties have been heat processed for less time or at lower internal temperatures than those prescribed in Table A. Since they are essentially raw, these patties must be thoroughly cooked by the consumer before serving them.

Char-marked. These uncured meat patties have also been heat processed for less time or at lower internal temperatures than those prescribed in Table A. Heat is only applied to obtain distinctive marks (e.g., grill marks) on the patty. Like partially cooked patties, they are still raw and the consumer must thoroughly cook these patties before serving them.

Note: *Since partially cooked and char-marked products are not ready-to-eat products, FSIS does not have internal temperatures and holding times established for these products. However, FSIS requires that establishments producing these products meet a stabilization performance standard identical to the stabilization standard for fully cooked meat patties.*

Verifying the Establishment's Heat Process

When verifying fully cooked meat patty temperatures, the inspection program employee:

- Should verify the accuracy of the thermocouple thermometer. All thermometers require some calibration to be accurate. The FSIS-issued thermocouple thermometers (see page 22.10) are calibrated at the factory against an instrument traceable to the National Institute of Standards & Technology (NIST). These thermometers should remain calibrated for 2 to 3 years. To calibrate the thermometer, the inspection program employee should check it at 32° F and also at 212° F. Insert the probe of the thermometer into a water bath at these temperatures and allow it to remain for at least 1 minute before taking a reading. Compare these readings with a mercury-in-glass thermometer of known accuracy at the same temperatures. If the thermocouple thermometer is off by more than 1° F, it should

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not be used. Contact your supervisor for a replacement and instructions for returning the inaccurate unit for servicing.

NOTE: *The accuracy of the FSIS-issued thermocouple thermometer should be verified at a minimum of once a month. If the thermometer has been mishandled, its accuracy should be verified prior to taking patty temperatures.*

The establishment's temperature-measuring device must also be accurate to 1° F. The time measuring device used by the establishment must measure time to the nearest second or less. To verify the accuracy of the establishment's temperature measuring devices, the inspection program employee may observe an establishment representative checking (calibrating) the temperature-measuring devices *against a temperature-measuring device of known accuracy* or review the calibration record.

- Must verify the internal temperature and holding time of a patty.

Patties, by the very nature of their shape, present a challenge in determining the internal temperature, especially of the "just-cooked" patty. Most patties are heat-processed by gas flames or hot oils as they travel on a conveyor belt through a broiler or fryer. The surface of the patty becomes very hot and the heat is transferred from the exterior of the patty to the interior by a process known as conduction until the entire patty is the same temperature. This process is cut short by removing the patty from the heat source. The interior temperature of the patty will continue to rise 3° F or more even after it is removed from the heat source. The typical dial thermometer that has been used by FSIS personnel for many years is not suitable for verifying the internal temperature of uncured fully cooked meat patties. The "sensing" portion of the dial thermometer probe extends approximately 2 inches from the tip. This type of probe gives an average temperature along this 2 inch span. Averaging the temperature gradient results in a faulty reading in a patty that may have a range of more than 200° F on the surface to less than 140° F in the interior. For example, $200^{\circ}\text{F (surface)} + 135^{\circ}\text{F (interior)} \div 2 = 167.5^{\circ}\text{F}$ indicates that the patty is fully cooked when, in fact, it is not (135° F interior).

Verifying the internal temperature of fully cooked patties requires the newer, more accurate *thermocouple thermometers*. The sensitive part of the probe is the very tip and the probe is much smaller, making it easier to insert it into an individual patty. This thermometer has a digital read-out device that replaces the dial on the dial thermometer. Thermocouple thermometers are more expensive and fragile, therefore care in handling is necessary. The probe must be kept clean. Regular wiping with a damp cloth will usually suffice, but the probe may be cleaned with a mild soap and water. *Never use any form of solvent to clean the probe.*

The steps for measuring the internal temperature of a patty and determining the holding time are:

Step 1: Clean and sanitize the thermocouple thermometer probe.

The thermometer probe must be cleaned and sanitized prior to performing internal temperature verification. Remember, do not use solvents (ethanol, acetone, etc.).

Note: *The sanitizer must be coded D-2 or E-3 in the List of Proprietary Substances and Nonfood Compounds. If there is no entry in the List of Proprietary Substances and Nonfood Compounds, the establishment must have documentation on file to certify the compound as safe and suitable when used in accordance with the label instructions.*

Step 2: Temper the thermocouple thermometer probe.

A thermometer at room temperature or below cannot be inserted directly into a hot patty without having a cooling effect on it (the probe acts as a heat sink). Therefore the probe should be inserted into several patties successively to warm it up to the desired temperature range.

Step 3: Determine the cold spot of the heating unit.

The “cold spot” in the heating unit (cooker, fryer, etc.) must be determined. To determine the cold spot, check the temperature of a patty in each row as the patties exit the heating unit on the conveyor belt. The coldest location should be noted and the internal temperature check must be performed on a patty taken from that location.

Step 4: Insert the thermocouple thermometer probe into the patty.

As quickly as possible after the patty exits the heating unit, insert the thermometer probe from the side of the patty, placing the sensitive tip as close to the geometric center of the patty as possible.

NOTE: *Do not stack the patties and insert the thermometer probe through the center of the stack.*

Step 5: Read the digital display.

Immediately after the probe has been inserted into the patty, the thermometer will equilibrate, i.e., the reading will rise rapidly then slow when it is nears the internal temperature of the patty. You must take note of the temperature registered by the thermocouple thermometer after it equilibrates. If this temperature reading is below the establishment’s selected minimum internal temperature, *do not begin* monitoring the holding time until it reaches the selected minimum internal temperature. If the temperature reading is at or above the establishment’s selected minimum internal temperature, then *immediately begin* monitoring the holding time.

NOTE: *Do not wiggle the probe or tap the patty to increase the temperature reading. Also do not grip the patty between your fingers before taking the reading.*

NOTE: *The thermocouple thermometer is calibrated to read in 0.1° F increments. These readings may be rounded to the nearest whole number. For example, a digital read-out of 150.5° F to 150.9° F would be read as 151° F.*

Step 6: Check the holding time.

Fully cooked patties *must* comply with one of the time and temperature combinations given in Table A of §318.23. Hence, once the minimum internal temperature has been determined, the holding time *must* be determined. To do this, any timepiece that reads in seconds may be used; this includes pocket watches, wristwatches, and stopwatches. The establishment may elect to provide the inspection program employee with a timing device identical to the one used by the establishment personnel.

Compliance

A heat process may be found to:

- Be in compliance
- Not be in compliance
- Require additional monitoring

The following are examples of each determination.

In Compliance. A processor is using a time and temperature combination of 155° F for 16 seconds. The thermometer shows a temperature of 155° F when first inserted, then continues to rise to 157° F before coming back to 155° F. The time interval between the first reading of 155° F and the subsequent rising and falling below 155° F is 18 seconds. *The time and temperature combination has been met for this product.*

Not in Compliance. A processor is using a time and temperature combination of 151° F for 41 seconds. The thermometer shows a temperature reading of 150° F when first inserted, then continues to rise to 153° F before coming back to 150° F. The time interval between the first registered reading of 151° F and the subsequent rising and falling below 151° F is 28 seconds. *The time and temperature combination has not been met for this product.*

Process Requiring Additional Monitoring. If a processor fails to meet the selected time and temperature combinations, but meets one of the other time and temperature combinations, this would not be classified as a cooking deviation (e.g., the selected time and temperature combination was 154° F for 20 seconds, but the process met 155° F for 16 seconds or 153° F for 26 seconds). Although this is not considered a deviation, it may indicate a lack of process control and the inspection program employee may decide to perform additional unscheduled procedures to ensure one of the time and temperature combinations is met.

Stabilization Requirements

Process steps or controls applied to fully cooked meat patties to bring about the death (lethality) of certain pathogenic microorganisms, particularly heat treatment, can create a model environment for the multiplication of spore-forming bacteria. Spores of *Clostridium botulinum*, *Clostridium perfringens*, and other spore-forming bacteria can

survive cooking and, in fact, thrive in the warm product following cooking after competitive microorganisms, such as *Salmonella*, have been eliminated.

The process of partially cooking and char-marking meat patties also creates a model environment for the growth of *Clostridium perfringens*, *Clostridium botulinum*, and other spore-forming, toxigenic bacteria. Cooking by the consumer, retailer, or other end-user may **not** eliminate these bacteria from these products. Therefore, it is important that bacterial growth be controlled in these products to the extent possible while they remain at the producing establishment.

The regulations require establishments to stabilize fully cooked, partially cooked and char-marked meat patties to prevent multiplication of toxigenic microorganisms such as *C. botulinum*, and allow no more than a 1-log₁₀ multiplication of *C. perfringens*. Limiting the growth of *C. perfringens* to a 1-log₁₀ increase effectively limits the multiplication of other, slower growing spore-forming bacteria, such as *Bacillus cereus*.

Establishments producing heat-processed meat patties using a stabilization process other than one conducted in accordance with the HACCP system requirements (Part 417), must develop and have a process schedule on file and available to FSIS. Each process schedule must be approved in writing by a process authority for safety and efficacy in meeting the performance standards established for the product in question.

FSIS anticipates that most establishments will not have any difficulty meeting the stabilization performance standard if they rapidly cool products after the heat treatment. Spiral-type freezers and CO₂ tunnel freezers in use today have the capability of freezing product in a short period of time. More stabilization performance standard verification checks will need to be performed in those establishments that place heat-processed patties on trays, racks, etc., and use conventional freezers to cool the patties.

To assist establishments in meeting the stabilization requirements, FSIS has issued "compliance" guidelines. The guidelines are based on the chilling recommendations in FSIS Directive 7110.3, TIME/TEMPERATURE GUIDELINES FOR COOLING HEATED PRODUCTS and the product cooling requirements in previous regulations. When applied, these cooling guidelines produce heat-processed meat patties that meet the stabilization performance standard.

Remember that the thermocouple thermometer probe must be cleaned and sanitized and tempered (cooled to the correct temperature range by inserting the probe into a few patties) before measuring the internal temperature of a patty to determine if the establishment has met the stabilization performance standard (e.g., cooling).

Heating Deviations

A "deviation" occurs when uncured **fully cooked** meat patties are not heated in accordance with the time and temperature combination requirements identified in §318.23 of the regulations.

If for any reason a heating deviation has occurred, the official establishment must:

- Investigate and identify the cause of the deviation.
- Take steps to ensure that the deviation will not recur.
- Create and maintain a report of the investigation that identifies the cause and nature of the deviation, as well as the steps that will be taken to prevent reoccurrence.

This written report is to be placed on file in the establishment and be available for review, upon request, by an FSIS program employee.

Note: *If the establishment has identified the heat treatment step as a CCP in its HACCP plan and fails to meet the time and temperature combination, then a deviation from critical limit exists. The plant must implement the corrective actions of '417.3(a) of the regulations instead of the actions above.*

In the case of a heating deviation, the establishment may use one of the following procedures to dispose of the affected product:

- Reprocess the affected product to a time and temperature combination listed in Table A in §318.23 of the regulation.
- Add the affected product as an ingredient (rework) into another product that will be heat-processed to one of the time and temperature combinations listed in Table A in §318.23 of the regulation, or

NOTE: *When reworking the affected product into another product, the establishment must be careful not to violate the final product's standard of identity or upset the order of predominance of the ingredients.*

- Relabel the affected product as partially cooked, if it meets the stabilization performance standard.

Labeling Requirements

Partially Cooked Patties must be labeled "Partially Cooked: For Safety Cook Until Well Done (Internal Meat Temperature 160° F)."

Char-Marked Patties must be labeled "Uncooked, Char-Marked: For Safety Cook Until Well Done (Internal Meat Temperature 160° F)."

NOTE: *These labeling statements must be adjacent to the product name, at least one-half the size of the largest letter in the product name, and prominently placed with such conspicuousness as to render it likely to be read and understood by an ordinary individual*

under customary conditions of purchase and use. They were designed to (1) assist consumers in the safe cooking of these products and (2) reduce the possibility of consumers mistaking partially cooked patties for fully cooked patties.

NOTE: *Since partially cooked and char-marked meat patties are essentially raw, safe-handling instructions must also appear on the label.*

REVIEW

RESOURCES:

1. Meat Inspection Regulations §318.23
2. FSIS Directive 7370.1
3. Uncured Heat-Processed Meat Patties Module

Answer the following questions.

1. Which of the following uncured heat-processed meat products are subject to the requirements of §318.23 of the regulations?
 - a. Hamburger patties
 - b. Whole muscle pork fritters
 - c. Meat Loaf
 - d. Pork Sausage patties
 - e. Salisbury steaks
 - f. Meatballs
 - g. Chunked and formed breaded veal steaks
2. The daily production schedule indicates that the establishment intends to manufacture two lots of fully cooked beef patties.
 - a. One lot of patties will be cooked to an internal temperature of 153° F. How long must the establishment hold internal temperature of the patties at 153° F?
 - b. The other lot of patties will be cooked to an internal temperature of 160° F. How long must the establishment hold the internal temperature of the patties at 160° F?
3. For the purpose of MPI Regulation §318.23, the term “heat-processed” is used to describe meat patties that have had their internal temperature raised to a minimum of 140° F.
 - a. True
 - b. False

4. How often should the inspection program employee calibrate (check the accuracy of) the thermocouple thermometer?
 - a. Prior to every internal temperature check
 - b. Once every six months
 - c. At least once a month
 - d. At least once a year
5. What is the stabilization performance standard for uncured heat-processed meat patties?
- 6a. What special labeling statement must appear on the label of uncured meat patties heated to:
 1. An internal temperature of 143° F?
 2. An internal temperature of 60° F to apply grill marks?
- b. Where and how should the labeling statement appear on the label?
7. How is the cold spot determined in a broiler where patties exit in several rows across a conveyor belt?

8a. If a heating deviation occurs, what action must be taken by establishment management?

b. What can the establishment do with the affected product?

9. When does the thermocouple thermometer probe need cleaning and sanitizing?

10. In an emergency situation, e.g., the thermocouple thermometer is broken or inaccurate, the inspection program employee may use the dial thermometer to perform temperature checks.

- a. True
- b. False

Explain your answer.

11. According to §318.23 of the regulations, the establishment must keep records that document:

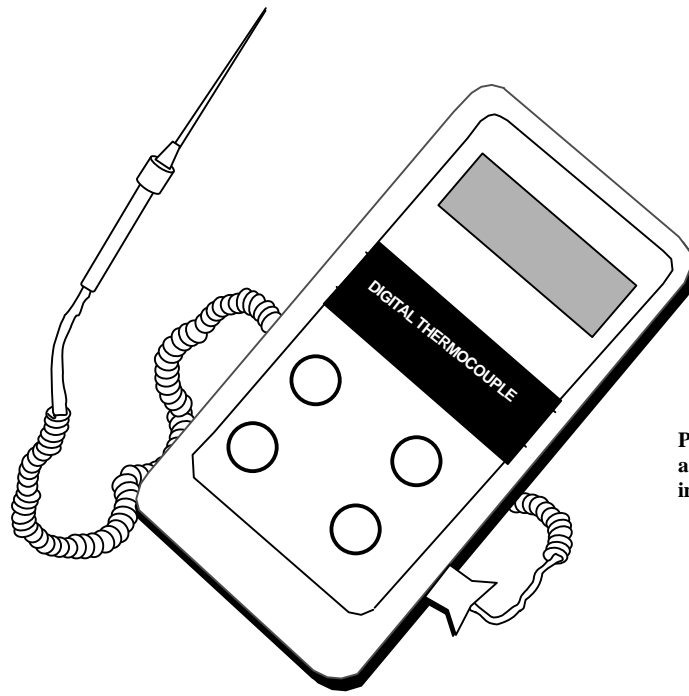
- a. Heating deviations
- b. Patty cooling times and temperatures
- b. Patty heating temperatures and/or time and temperature combinations
- c. Storage room temperature

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12. Which of the following describes the correct method of inserting the thermocouple thermometer probe into a patty when performing the review and observation component of procedures 03G01 or 03G02.
 - a. Grip the patty firmly between the fingers and insert the probe from the side of the patty, putting the probe tip as close to the geometric center of the patty as possible.
 - b. Stack three or four patties on top of each other and insert the probe through the center of the stack
 - c. Lay the patty on a flat, sanitary surface and insert the probe into the center of the patty.
 - d. Lay the patty on a flat, sanitary, tempered surface near the edge of the conveyor and insert the probe from the side of the patty, putting the probe as close to the geometric center of the patty as possible.
13. The daily production schedule indicates that the establishment intends to manufacture a lot of fully cooked beef patties by raising the internal temperature of the patties to 154° F for 20 seconds. The inspection program employee performed the review and observation component of procedure 03G01 and found the temperature reading to be 151° F when the probe was first inserted. The reading continued to rise to 153° F. The time interval between the first 151° F reading and the subsequent rising and falling below 151° F was 125 seconds. What action should the inspection program employee take?
 - a. Notify establishment management that a heating deviation has occurred.
 - b. Retain the subplot, i.e., patties produced since the last time/temperature check (approximately 1 hour's production), and have the establishment reprocess, rework, or relabel the affected patties.
 - c. Retain the patties produced from the beginning of the shift up until the time procedure 03G01 was performed, and have the establishment reprocess, rework, or relabel the affected patties.
 - d. Do not officially retain any patties; notify establishment management that they are not meeting their selected time and temperature combination; and perform additional unscheduled 03G01 and 03G02 procedures as directed by your supervisor.
 - e. Notify establishment management that they are producing patties that are out of compliance.

THERMOCOUPLE THERMOMETER

J and K Thermocouple
Thermometers

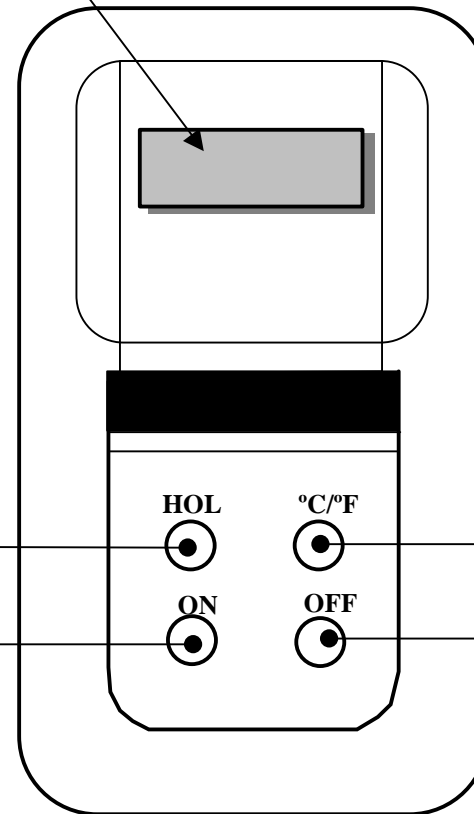


BARNANT 90

Model No. 600-2830 (J)
600-2840 (K)

Readouts & Controls

DISPLAY 4-digit display (self-check indication shown)
Capacity : 999.9 or 2999 degrees



Press to freeze
a desired reading
in display*

Press to activate
desired function

When instrument is
energized, setting
defaults to: F temperature
scale

KEYPAD FUNCTIONS

Press to select Celcius or Fahrenheit

Turns power OFF

These handheld *precision* thermometers are designed for general-purpose use with J or K thermocouples (ordered separately). They have lots of versatility combined in one rugged, economical instrument. A microprocessor makes them a powerful temperature-reading instrument. Easy to operate, too. Every function is fully annunciated and key-activated.

*Press again to toggle back to original function